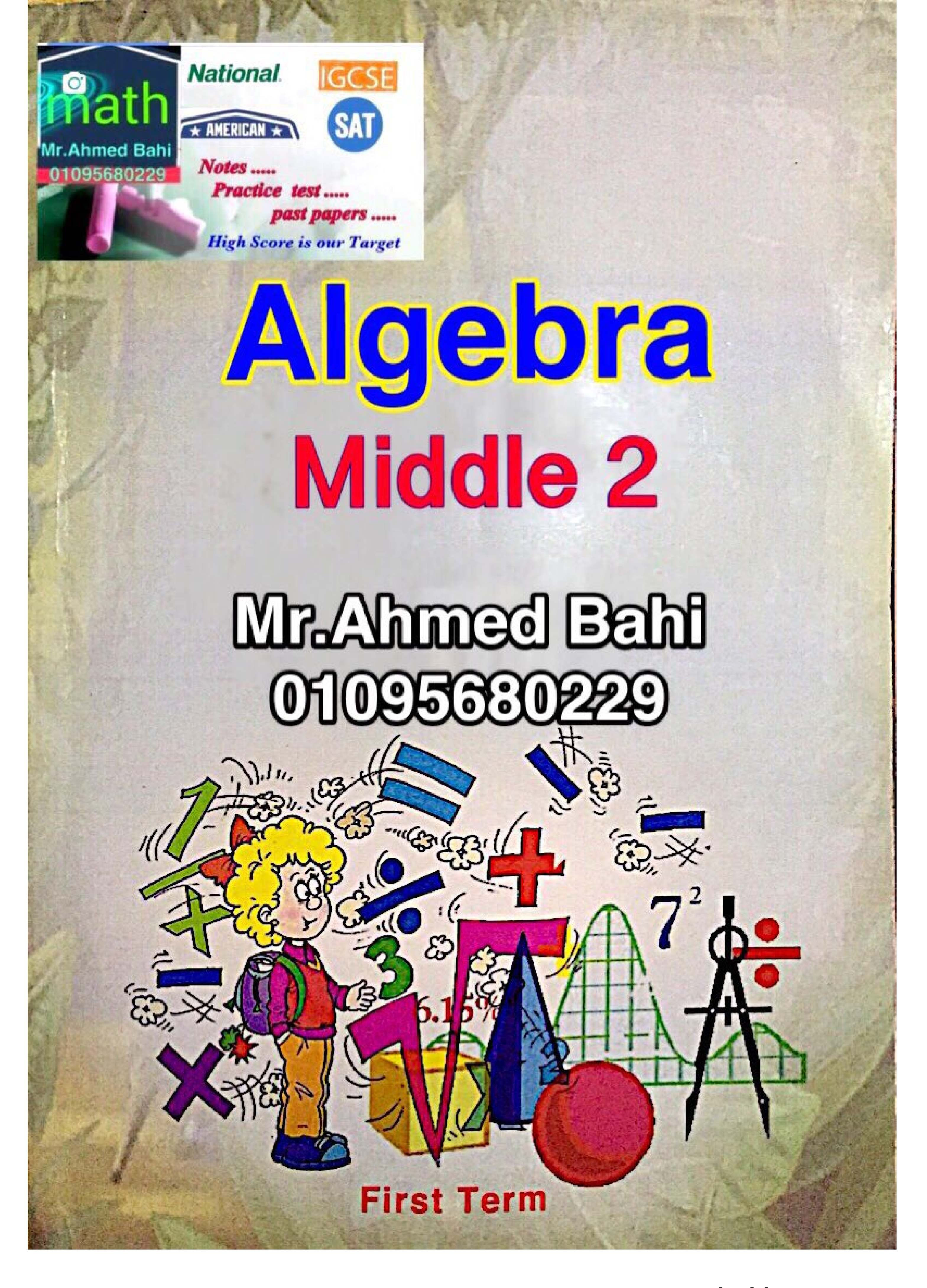

math
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National
IGCSE
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SAT
Notes .....
Practice test .....
past papers .....
High Score is our Target
Algebra
Middle 2
Mr.Ahmed Bahi
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First Term

Unit (1) Real numbers

Lesson (1): The cube root of a rational number.

Lesson (2): The set of irrational numbers Q'

- Finding the approximate value of an irrational number.
- Representing an irrational number on the number line.

Lesson (3): The set of real numbers R – Ordering numbers in R.

Lesson (4): Intervals.

Lesson (5): Operations on the real numbers.

Lesson (6): Operations on the square roots.

Lesson (7): The two conjugate numbers.

Lesson (8): Operations on the cube roots.

Lesson (9): Applications on the real numbers.

Lesson (10): Solving equations and inequalities of the first degree in one variable in R.



Revision

Find the value of X which satisfies each of the following equations:

1) $5X + 3 = 20$

....

....

....

2) $7X + 11 = 12$

....

....

....

3) $3X + 5 = 1$

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4) $X + 3 = 7$

....

....

....

Unit (1) Real numbers

Lesson (1): The cube roor of a rational number

Remark (1):

1) $\sqrt[3]{a^3} = a$

For example: $\sqrt[3]{5^3} = 5$, $\sqrt[3]{(-5)^3} = -5$

2) $\sqrt[3]{a^n} = a^{n/3}$ where $n \in z$

For example: $\sqrt[3]{a^6} = a^{6/3} = a^2$

Example (1): Find each of the following, and check your answer using a calculator:

1) $\sqrt[3]{216}$

....

....

2) $\sqrt[3]{\frac{-8}{125}}$

....

....

3) $\sqrt[3]{0.064}$

Exercises (1-1):

1) Complete:

a) $\sqrt[3]{a^3} = \ldots\ldots$

....

b) $\left|\sqrt[3]{-125}\right| = \sqrt{\ldots\ldots}$

....

c) $\sqrt{q} + \sqrt[3]{-8} = \ldots\ldots$

....

2) Choose:

a) $\sqrt[3]{(-8)^2} = \ldots\ldots\ldots$

i) 2 ii) -2 iii) 4 iv) -4

....

b) $\sqrt{25}$ - $\sqrt[3]{-125} = \ldots\ldots$

i) 10 ii) zero iii) 5 iv) ± 5

....

c) $\sqrt[3]{3\frac{3}{8}} + \sqrt{0.25} = \ldots\ldots\ldots$

i) $\frac{3}{2}$ ii) $\frac{1}{2}$ iii) 2 iv) -2

2) Choose:

d) $\sqrt[3]{-27} + \sqrt{12\frac{1}{4}} + \sqrt[3]{0.125} = \ldots\ldots\ldots$

i) 1 ii) zero iii) -1 iv) $\frac{11}{2}$

....

....

e) $\sqrt[3]{X^6} = \sqrt{\ldots\ldots}$

i) X^3 ii) X^2 iii) X iv) X^4

....

....

Example (2): Solve each of the following equations in Q:

1) $40X^3 - 1 = -136$

....

....

2) $(y-2)^3 = -343$

....

....

Exercises (1-2):

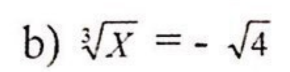
1) Find the value of X in each of the following:

a) $\sqrt[3]{X} = 5$

....

....

....



b) $\sqrt[3]{X} = -\sqrt{4}$

....

....

....



c) $X^3 = -8$



....

....

....

d) $X^3 = 64$

....

....

....

2) Find the S.S of each of the following in Q:

a) $X^3 + 27 = 0$

....

b) $8X^3 + 7 = 8$

....

....

c) $(X + 3)^3 = 343$

....

....

d) $(5X - 2)^3 + 10 = 18$

....

....

Remark (2):

1- The volume of a cube = the edge length × itself × itself

2- The area of one face of a cube = the edge length × itself

3- The lateral area of a cube = the area of one face × 4

4- The total area of a cube = the area of one face × 6

5- The volume of the sphere = $\frac{4}{3}\pi r^3$, r = the radius length of the sphere.

Example (3): Find each of the following:

1- The length of the inner edge of a vessel in the shape of a cube if its capacity = 8 liters.

....

....

2- The radius length of a sphere of volume $\frac{36}{125}\pi\ cm^3$

....

....

....

3- The diameter length of a sphere of volume equals 38808 cm3 ($\pi = \frac{22}{7}$)

....

....

....

Exercises (1-3):

1) Find the inner edge length of a cube vessel with capacity of one liter.

....

....

....

2) Find the diameter length of a sphere whose volume = $\frac{1372}{81}\pi$ cube unit.

....

....

....

Unit (1)

Lesson (2): The set of irrational numbers Q'

Note:

1- All integers are rational numbers.

For example: 3 is a rational number because it can be expressed as $\frac{3}{1}$ or $\frac{6}{2}$ or .....

2- All decimals are rational numbers.

For example: 2.5 is a rational number because it can be expressed as $\frac{25}{10}$ or $\frac{5}{2}$ or ......

3- All percentages are rational numbers.

For example: 15% is a rational number because it can be expressed as $\frac{15}{100}$ or $\frac{150}{1000}$ or ......

4- The square root of a perfect square rational number.

For example: $\sqrt{36}$, $\sqrt{\frac{4}{25}}$ and $\sqrt{0.09}$ are all rational numbers where : $\sqrt{36} = 6$, $\sqrt{\frac{4}{25}} = \frac{2}{5}$ and $\sqrt{0.09} = \sqrt{\frac{9}{100}} = \frac{3}{10}$

5- The cube root of a perfect cube rational number is a rational number.

For example: $\sqrt[3]{8}$, $\sqrt[3]{-64}$ and $\sqrt[3]{\frac{27}{1000}}$ are all rational numbers where $\sqrt[3]{8} = 2$, $\sqrt[3]{-64} = -4$ and $\sqrt[3]{\frac{27}{1000}} = \frac{3}{10}$

Irrational numbers:

1- The square root of a rational number which is not a perfect square is not a rational number.

For example: $\sqrt{2} \notin Q$ because there is no rational number whose square is 2, so $\sqrt{2}$ cannot written as $\frac{a}{b}$ where a and b are integers, $b \neq 0$

2- The cube root of a rational number which is not a perfect cube is not a rational number.

For example: $\sqrt[3]{4} \notin Q$ because there is no rational number whose cube is 4, so $\sqrt[3]{4}$ cannot written as $\frac{a}{b}$ where a and b are integers, $b \neq 0$

3- π is not a rational number (However $\frac{22}{7}$, 3.14 and 3.142 are rational numbers, each of them represents an approximating value of π).

4- Other examples of numbers not rational: $\sqrt{5} + 1$, $1 - \sqrt[3]{7}$, $2\sqrt{7}$, $-\frac{\sqrt[3]{9}}{5}$

Notice that: Q and Q' are disjoint sets i.e. $Q \cap Q' = \varphi$

Example (1):

Show which of the following numbers belongs to Q and which of them belongs to Q':

1) $\sqrt{0.49}$ 2) $\sqrt[3]{-0.064}$ 3) $\sqrt{\frac{25}{49}}$

4) $\sqrt[3]{\frac{25}{49}}$ 5) $\sqrt{25}+\sqrt[3]{16}$

Solution:

1) $\because \sqrt{0.49} = 0.7 = \frac{7}{10}$ $\therefore \sqrt{0.49} \in Q$

2) $\because \sqrt[3]{-0.064} = -0.4 = -\frac{4}{10}$ $\therefore \sqrt[3]{-0.064} \in Q$

3) $\because \sqrt{\frac{25}{49}} = \sqrt{\left(\frac{5}{7}\right)^2} = \frac{5}{7}$ $\therefore \sqrt{\frac{25}{49}} \in Q$

4) $\because \sqrt[3]{\frac{25}{49}} \notin Q$ because there is no rational number whose cube is $\frac{25}{49}$

$\therefore \sqrt[3]{\frac{25}{49}} \in Q'$

5) $\because \sqrt{25}+\sqrt[3]{16} = 5+\sqrt[3]{16}$

$\because$ There is no rational number whose cube is 16

$\therefore \sqrt[3]{16} \notin Q$ $\therefore (5+\sqrt[3]{16}) \notin Q$ $\therefore (\sqrt{25}+\sqrt[3]{16}) \in Q'$

Exercises (1-4):

1) **Find two consecutive integers for each of the following numbers to be included between them:**

a) $\sqrt{5}$ b) $\sqrt{12}$

....

....

....

2) **If X is an integer, find the value of X in each of the following cases:**

a) $X < \sqrt{2} < X + 1$

....

....

....

b) $X < \sqrt{80} < X + 1$

....

....

....

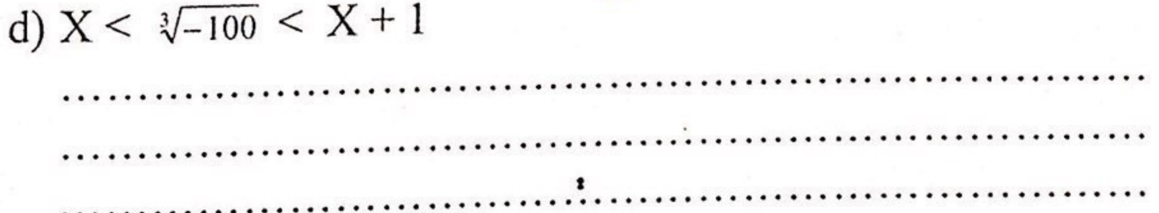
c) $X < \sqrt[3]{5} < X + 1$

....

....

....

d) $X < \sqrt[3]{-100} < X + 1$



....

....

....

3) Choose the correct answer from the given ones:

1) The irrational number located between 2 and 3 is ……

a) $\sqrt{10}$ b) $\sqrt{7}$ c) 2.5 d) $\sqrt{3}$

…………………………………………………………………

…………………………………………………………………

2) The irrational number located between -2 and -1 is ……

a) -3 b) $-1\frac{1}{2}$ c) $-\sqrt{3}$ d) $\sqrt{2}$

…………………………………………………………………

…………………………………………………………………

3) $\sqrt{10} \cong$ …….

a) 2.99 b) 3.71 c) 3 d) -3.2

…………………………………………………………………

…………………………………………………………………

4) The nearest integer to $\sqrt[3]{25}$ is ……

a) 5 b) 3 c) 2 d) 12.5

…………………………………………………………………

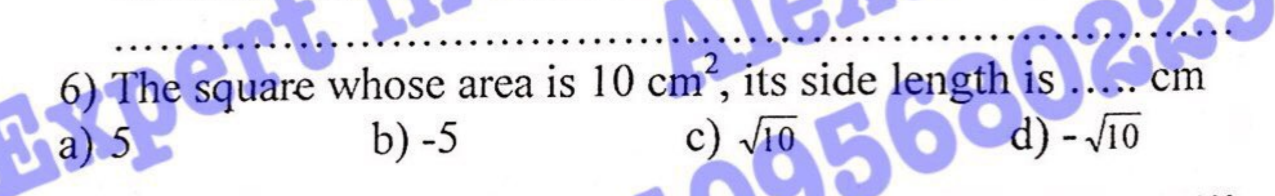
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5) The area of a square whose side length is $\sqrt{3}$ cm is …. cm^2

a) $4\sqrt{3}$ b) 9 c) 3 d) 6

…………………………………………………………………

…………………………………………………………………



6) The square whose area is 10 cm^2, its side length is …. cm

a) 5 b) -5 c) $\sqrt{10}$ d) $-\sqrt{10}$

…………………………………………………………………

…………………………………………………………………

7) The S.S of the equation: $(X - \sqrt{5})(X + \sqrt{3}) = 0$ in Q' is ……

a) $\{\sqrt{5}\}$ b) $\{-\sqrt{3}\}$ c) $\{-\sqrt{5}, \sqrt{3}\}$ d) $\{\sqrt{5}, -\sqrt{3}\}$

…………………………………………………………………

…………………………………………………………………

4) Find the value of X in each of the following cases and determine whether $X \in Q$ **or** $X \in Q'$:

a) $4X^2 = 9$

....

....

....

....

b) $X^3 = 125$

....

....

....

....

c) $(X-1)^2 = 4$

....

....

....

....

d) $(x-5)^3 = 1$

....

....

....

....

5) Find in Q' the S.S of each of the following equations:

a) $(X^3 + 5)(X^2 - 3) = \text{zero}$

....

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....

....

b) $(X + \sqrt{7})(X^3 - 6) = \text{zero}$

....

....

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6) Prove that:

a) $\sqrt{2}$ is included between 1.4 and 1.5

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....

b) $\sqrt{11}$ is included between 3.31 and 3.32

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....

c) $\sqrt[3]{15}$ is included between 2.4 and 2.5

....

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Representing an irrational number on the number line by using graph paper:

Examples:

1) Represent $\sqrt{5}$ on the number line.

Steps:

- $(\sqrt{5})^2 = 5$
- Draw right angled triangle on a number line with side = $\frac{5-1}{2} = 2$

  and hypotenuse = $\frac{5+1}{2} = 3$

  ....

  ....

  ....

2) Represent - $\sqrt{5}$ on the number line.

....

....

....

3) Represent 1 + $\sqrt{5}$ on the number line.

....

....

....

4) Represent $1 - \sqrt{5}$ on the number line.

....

....

....

5) Represent $2 + \sqrt{5}$ on the number line.

....

....

....

6) Represent $2\sqrt{5}$ on the number line.

....

....

....

Exercises (1-5):

Draw the number line and label point A which represent $\sqrt{2}$

a) Label point B which represent $1+\sqrt{2}$

....

....

....

b) Label point C which represent $1- \sqrt{2}$

....

....

....

Unit (1)

Lesson (3): The set of real numbers R and Ordering numbers in R.

The set of real numbers:

It is the set obtained from the set of rational numbers and the set of irrational numbers. It is obtained by R

$R = Q \cup Q'$

$Q \cap Q' = \varphi$

The opposite venn diagram shows that:

$N \subset Z \subset Q \subset R$ and $Q' \subset R$

Set of rational number Q: Set of integer Z: Set of rational numbers N	Set of irrational number Q'

Remarks:

- $R_+ \cap R_- = \varphi$
- $R = R_+ \cup \{0\} \cup R_-$
- The number zero is neither positive nor negative.

- $R_+ \cup \{0\} = \{x : x \in R, x \geq 0\}$ and it is called the set of the non-negative real numbers.
- $R_- \cup \{0\} = \{x : x \in R, x \leq 0\}$ and it is called the set of the non-positive real numbers.
- The set of real numbers without zero (The non-zero real numbers) is denoted by R^*
  i.e $R^* = R - \{0\} = R_+ \cup R_-$

Exercises (1-6):

1) **Complete the following table by placing (√) in the suitable place as shown in the first case:**

The number	Natural	Integer	Rational	Irrational	Real
-5	×	√	√	×	√
$\sqrt{2}$					
$1\frac{1}{2}$					
$\sqrt[3]{9}$					
$\lvert -2 \rvert$					
$-\sqrt{4}$					
$\frac{5}{2}$					
0.3					
$\sqrt{-1}$					

2) Complete the following:

1) $Q \cap Q' = \dots\dots\dots$

2) $Q \cup Q' = \dots\dots\dots$

3) $R_{+} \cap R_{-} = \dots\dots\dots$

4) $R_{+} \cup R_{-} = \dots\dots\dots$

5) $R - Q' = \dots\dots\dots$

6) $R - Q = \dots\dots\dots$

3) put the suitable sign (>, < or =):

1) $\sqrt{5}$ ….. 2

2) $\sqrt{7}$ ……. 2.6

3) $\sqrt[3]{24}$ …… 3

4) $\sqrt[3]{-24}$ ……. -2

5) $3 - \sqrt{5}$ ….. $\sqrt[3]{-1}$

6) $\sqrt[3]{8}$ ……. $\sqrt{4}$

7) $1 + \sqrt{3}$ …… $\sqrt{5}$

8) $\sqrt[3]{3} - 1$ ……. 0.2

9) $\sqrt{2} - 1$ ……. $1 - \sqrt{2}$

4) Arrange the following numbers ascendingly:

1) $\sqrt{8}$, $-\sqrt{3}$, $\sqrt{15}$, $\sqrt{5}$, $-\sqrt{7}$ and $-\sqrt{11}$

…………………………………………………………………………

2) $\sqrt{27}$, $-\sqrt{45}$, $\sqrt{20}$, 0.6 and $\sqrt[3]{-1}$

…………………………………………………………………………

5) Arrange the following numbers descendingly:

1) $\sqrt{62}$, $8 - \sqrt{50}$ and $\sqrt{70}$

…………………………………………………………………………

2) $\sqrt{6}$, 9, $-\sqrt{10}$, $-\sqrt{7}$, $-\sqrt{50}$ and $\sqrt{101}$

…………………………………………………………………………

6)Solve the following equations to the nearset hundredth given X ∈

a) $X^2 - 6 = 0$

....
....
....
....

b) $\frac{3}{4} X^2 = 24$

....
....
....
....

c) $(X^2 - 9)(X^3 - 5) = 0$

....
....
....
....

d) $(2X^3 - 5)(X^2 + 1) = 0$

....
....
....
....

7) Find the side length of a square whose area is 15 cm^2. Is the side length a rational number?

....
....
....

8) Find the edge length of a cube whose volume is 1.728 cm^3. Is the edge length a rational number?

....
....
....
....

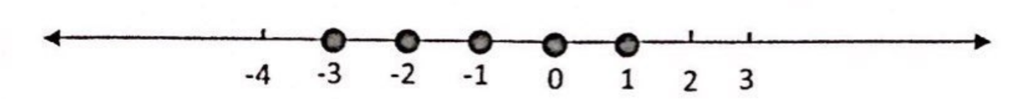
Unit (1)

Lesson (4): Intervals

X = the set of integers

$X = \{a : a \in Z, -3 \le a \langle 2\}$

X = { -3, -2, -1, 0, 1}



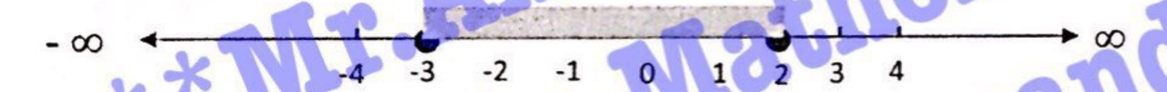
First: limited interval:

A) Closed interval:

$X = \{a : a \in R, -3 \le x \langle 2\}$

Expresses the set of real number

Denoted by [-3, 2] and called closed interval

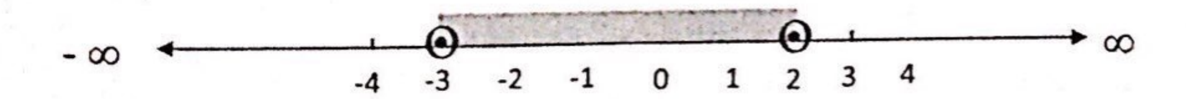


Notice that: -3 ∈ [-3, 2] , 2 ∈ [-3, 2]

B) Opened interval:

$X = \{x : x \in R, -3 \langle x \langle 2\}$

Denoted by]-3, 2[and called opened interval

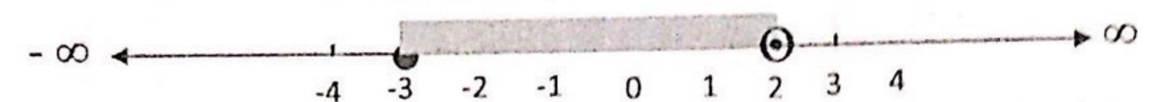


Notice that: -3 ∉]-3, 2[and 2 ∉]-3, 2[

C) Half opened interval (Half closed interval):

$X = \{x : x \in R, -3 \le x \langle 2\}$

Denoted by [-3, 2[

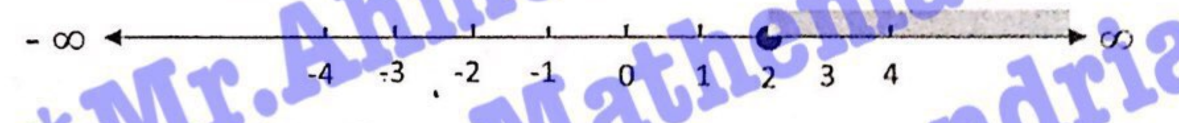


Notice that: $-3 \in [-3, 2[$ and $2 \notin [-3, 2[$

Second: Unlimited intervals:

1) $X = \{x : x \in R\ ,\ x \ge 2\}$

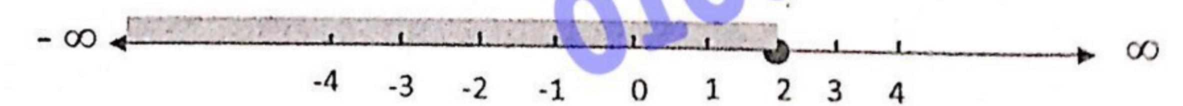
Denoted by [2, ∞[



Notice that: $2 \in [2, \infty[$

2) $X = \{x : x \in R\ ,\ x \le 2\}$

Denoted by]-∞, 2]



Notice that: $2 \in]-\infty, 2]$

Remarks:

1) R =] -∞ , ∞[
2) R_+ =]0 , ∞[
3) R_- =]- ∞, 0[
4) The set of non-negative real numbers = $R_+ \cup \{0\}$ = [0, ∞[
5) The set of non-positive real numbers = $R_- \cup \{0\}$ =]- ∞, 0]

Exercises (1-7):

1) **Complete the following table:**

The interval	Expression by description method	Its representation on the number line
[-1, 2]	$\{x : -1 \leq x \leq 2 , x \in R\}$	-1 2
[1, 3]	....	
....	$\{x : 0 < x \leq 3 < x \in R\}$	
....	....	-2 3

2) **Complete each of the following using one of the symbols** ∈ or ∉ :

1) 3 .... [3, 5]
2) -2 ....]-2, 1]
3) 0........... [-1, 4[
4) $|-3|$ .... [2, ∞[
5) $\sqrt{9}$ ....]-3, ∞[
6) $\sqrt[3]{-1}$ ....]-∞,1[
7) 1.3×10^{-5} .... R_+
8) $\sqrt{2}$ .... [2, 5]
9) 5 ......]$\sqrt{5}$, $\sqrt{23}$[
10) $\sqrt[3]{-125}$ ......]- $\sqrt{25}$, $\sqrt{25}$[

3) If $X = [2, 5[$ and $Y =]-1, 3]$, find using the number line:

1) $X \cup Y$ 2) $X \cap Y$

....

3) $X - Y$ 4) $Y - X$

....

5) $X^{\backslash}$ 6) $Y^{\backslash}$

....

4) If $X =]-\infty , 3]$ and $Y = [-4, \infty[$, find using the number line:

1) $X \cup Y$ 2) $X \cap Y$

....

3) $X - Y$ 4) $Y - X$

....

5) $X^{\backslash}$ 6) $Y^{\backslash}$

....

5) If $X = [-1, 4[$ and $Y = [3,\infty[$ and $Z = \{3 , 4\}$ find using the number line:

1) $X \cup Y$ 2) $X \cap Y$

....

3) $X - Y$ 4) $X - Z$

....

5) $Y \cap Z$ 6) $Y - X$

....

7) $X^{\backslash}$ 8) $Y^{\backslash}$

....

6) **Choose the correct answer from the given ones:**

1) $[-3, 4] - \{-3, 5\} = \dots\dots$

(a) $]-3, 4[$ (b) $]-3, 4]$ (c) $]-3, 5[$ (d) $[-3, 5[$

2) If $X \in [-3, \infty[$, then ………

(a) $X < -3$ (b) $X \le -3$ (c) $X > -3$ (d) $X \ge -3$

3) If $X = \{x : x \in r, 2 < x \le 5\}$, then $[3, 4]$ …….. X

(a) $\in$ (b) $\notin$ (c) $\subset$ (d) $\not\subset$

4) $\{3\} \cap [3, 6] = \dots\dots$

(a) φ (b) $\{3\}$ (c) $]3, 6]$ (d) $\{6\}$

5) $\{8, 9, 10\} -]8, 10[= \dots\dots$

(a) φ (b) $\{8, 10\}$ (c) $\{9\}$ (d) N

6) The sum of all real numbers in $[-75, 75]$ is ………

(a) -75 (b) 75 (c) 150 (d) zero



Unit (1)

Lesson (5): Operations on the real numbers

Exercises (1-8):

1) **Find each of the following in the simplest form:**

a) $2\sqrt{3} + 5 + \sqrt{3} - 6$

....

....

b) $2\sqrt{7} + 3\sqrt{2} + \sqrt{7} + 5\sqrt{7}$

....

....

c) $\sqrt{2}\,(5 + \sqrt{2})$

....

....

d) $\sqrt{7}\,(\sqrt{7} + 2)$

....

....

e) $-\sqrt{3}\,(-5 - \sqrt{3})$

....

....

f) $\sqrt{5}(3 - \sqrt{5}) - 2(1 + \sqrt{5})$

....

....

2) Find the result of each of the following operation:

a) $(\sqrt{2} + 1)(\sqrt{2} - 1)$

....

....

b) $(\sqrt{3} + 2)(\sqrt{3} - 1)$

....

....

3) Make the denominator in each of the following an integer:

a) $\frac{10}{\sqrt{5}}$

....

....

b) $-\frac{6}{\sqrt{3}}$

....

....

c) $\frac{8}{\sqrt{3}}$

....

....

d) $\frac{6}{2\sqrt{3}}$

....

....

e) $\frac{25}{2\sqrt{10}}$

....

....

f) $\frac{\sqrt{2}+3}{\sqrt{2}}$

....

....

4) Complete the following:

a) The additive inverse of the number $1 - \sqrt{2}$ is ....

b) The multiplicative inverse of the number $\frac{2\sqrt{3}}{5}$ is $\frac{\cdots\cdots}{6}$

c) The multiplicative inverse of the number $\frac{3}{\sqrt{3}}$ is $\frac{\cdots\cdots}{\sqrt{3}}$

d) $7 + \sqrt{3} = 5 + (\ldots\ldots + \ldots\ldots)$

e) If $a \in R$ and $b \in R$, then $a - b$ means the sum of the number a and .... of the number b

f) If $a \in N$, $b \in Q$ and $c \in R$, then $a + b + c \in$ ....

5) Choose the correct answer from those given:

1) $2\sqrt{3} + 3\sqrt{3} =$ ....

(a) $5\sqrt{6}$ (b) $5\sqrt{3}$ (c) $6\sqrt{3}$ (d) $5\sqrt[3]{3}$

2) $5 + 7\sqrt{2} - 4 + \sqrt{2} =$ ....

(a) 15 (b) $1 + 7\sqrt{2}$ (c) $1 + 8\sqrt{2}$ (d) $1 + 6\sqrt{2}$

3) $-2\sqrt{3} \times \sqrt{3} =$ ....

(a) -6 (b) $-2\sqrt{3}$ (c) $2\sqrt{3}$ (d) 6

4) $(2\sqrt[3]{5})^3 =$ ....

(a) 10 (b) 20 (c) $4\sqrt[3]{5}$ (d) 40

5) The additives inverse of the number $\frac{6}{\sqrt{2}}$ is ....

(a) $-2\sqrt{3}$ (b) $2\sqrt{3}$ (c) $-3\sqrt{2}$. (d) $3\sqrt{2}$

Choose the correct answer from those given:

6) The additives inverse of the number $(\sqrt{2} - \sqrt{5})$ is ....

(a) $\sqrt{2}+\sqrt{5}$ (b) $\sqrt{5} - \sqrt{2}$ (c) $\sqrt{2}-\sqrt{5}$ (d) $-\sqrt{2}-\sqrt{5}$

7) The multiplicative inverse of the number $\sqrt{5}$ is ....

(a) -5 (b) $-\frac{1}{5}$ (c) $\frac{5}{\sqrt{5}}$ (d) $\frac{\sqrt{5}}{5}$

8) The multiplicative inverse of the number $\frac{\sqrt{2}}{6}$ is ....

(a) $\sqrt{3}$ (b) $3\sqrt{2}$ (c) $\sqrt{6}$ (d) $\frac{\sqrt{2}}{2}$

9) $(\sqrt{5} + 3\sqrt{5}) \div \sqrt{5} =$ ....

(a) $3\sqrt{5}$ (b) 3 (c) 5 (d) 4

10) If $X = \sqrt{2} + 10$, $Y = \sqrt{2} - 10$, then $(X+Y)^2 =$ ....

(a) 4 (b) 6 (c) 8 (d) $4\sqrt{2}$



Unit (1)

Lesson (6): Operations on the square roots

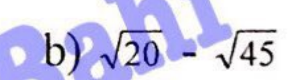
Exercises (1-9):

1) **Put each of the following in the form $a\sqrt{b}$ where a and b are two integers, b is the least possible value:**

a) $\sqrt{12}$ b) $\sqrt{28}$ c) $2\sqrt{72}$

2) **Simplify:**

a) $\sqrt{50} + \sqrt{8}$


b) $\sqrt{20} - \sqrt{45}$

c) $2\sqrt{18} + \sqrt{50} + \frac{1}{3}\sqrt{162}$

d) $\sqrt{27} + 5\sqrt{18} + \sqrt{300}$

e) $2\sqrt{5} + 4\sqrt{20} - 5\sqrt{\frac{1}{5}}$

f) (i) $2\sqrt{3} \times 5\sqrt{2}$

(ii) $2\sqrt{18} \times 3\sqrt{2}$

3) Choose the correct answer:

1) $\sqrt{8} - \sqrt{2} =$ ....

(a) $\sqrt{6}$ (b) $\sqrt{2}$ (c) 2 (d) 1

2) $(\sqrt{8} + \sqrt{2})^2 =$ ....

(a) $\sqrt{10}$ (b) 10 (c) 18 (d) $\sqrt{18}$

3) $(\sqrt{7} - \sqrt{5})(\sqrt{7} + \sqrt{5}) =$ ....

(a)2 (b) 12 (c) $2\sqrt{7}$ (d) $-5\sqrt{2}$

4) The multiplicative inverse of the number $\sqrt{50}$ is ....

(a) $\frac{\sqrt{2}}{10}$ (b)) $-\frac{\sqrt{2}}{10}$ (c) $-5\sqrt{2}$ (d) $5\sqrt{2}$

5) If $x = \frac{\sqrt{6}}{\sqrt{2}}$, then $x^{-1} =$ ....

(a) $\sqrt{3}$ (b) $\frac{\sqrt{3}}{2}$ (c) $\frac{\sqrt{3}}{3}$ (d) $2\sqrt{3}$

4) Complete the following:

a) $\sqrt{5}$, $\sqrt{20}$, $\sqrt{45}$, $\sqrt{80}$, ... in the same pattern

b) If $x^2 = 5$, then $(x + \sqrt{5})^2 =$ .... or ....

5) Find the value of each of x + y, x × y in each of the following cases:

a) $x = 3 + \sqrt{5}$, $y = 1 - \sqrt{5}$

b) $x = \sqrt{3} - \sqrt{2}$, $y = \sqrt{3} + \sqrt{2}$

c) $x = 5 - \sqrt{2}$, $y = 5 - 3\sqrt{2}$

Unit (1)

Lesson (7): The two conjugate numbers

Exercises (1-10):

1) **write the conjugate number of each of the following numbers:**

a) $\sqrt{5}+\sqrt{3}$ b) $5-2\sqrt{7}$ c) $\sqrt{5}+\frac{2}{\sqrt{2}}$

2) **If** $X = \frac{4}{\sqrt{7}-\sqrt{3}}$ and $Y = \frac{4}{\sqrt{7}+\sqrt{3}}$, find the value of: $X^2\ Y^2$

3) **If** $a = \sqrt{3}+\sqrt{2}$ and $b = \frac{1}{\sqrt{3}+\sqrt{2}}$, find the value of: $a^2 - b^2$ in its simplest form.

4) **If** $X = \sqrt{5} - \sqrt{3}$ and $Y = \frac{2}{\sqrt{5}-\sqrt{3}}$, find the value of: $X^2 + 2XY + Y^2$

5) **<u>If</u>** $X = \sqrt{5} - \sqrt{2}$ and $Y = \frac{3}{\sqrt{5} - \sqrt{2}}$, prove that X and Y are conjugate numbers, then find the value of: $X^2 - 2XY + Y^2$

6) **<u>If</u>** $X = \sqrt{5} + \sqrt{2}$ and $Y = \sqrt{5} - \sqrt{2}$, find the value of: $\frac{X+Y}{XY-1}$ in its simplest form.

7) **<u>If</u>** $a = \frac{4}{\sqrt{7} - \sqrt{3}}$ and $b = \frac{4}{\sqrt{7} + \sqrt{3}}$, find the value of: $\frac{a-b}{ab}$

8) **<u>If</u>** $X = \frac{4}{\sqrt{7} - \sqrt{3}}$ and $Y^{-1} = \frac{1}{\sqrt{7} - \sqrt{3}}$ (Remember that $Y^{-1} = \frac{1}{Y}$)

Prove that X and Y are conjugate numbers, then find the value of: X^2Y^2

9) **<u>If</u>** $X = \frac{\sqrt{6}+\sqrt{5}}{\sqrt{6}-\sqrt{5}}$, prove that: $X + \frac{1}{X} = 22$

10) **<u>Complete</u>**

1) If $X = 3 + \sqrt{2}$ then its conjugate is .... and the product of multiplying X by its conjugate is ....

2) The multiplicative inverse for $(\sqrt{3}+\sqrt{2})$ in its simplest form is ....

3) If $\frac{1}{X} = \sqrt{5} - 2$, then the value of X in its simplest form is ....

Unit (1)

Lesson (8): Operations on the cube roots

Exercises (1-11):

1) **Simplify:**

1) $\sqrt[3]{125} - \sqrt[3]{24}$

2) $\sqrt[3]{16} - \sqrt[3]{2}$

3) prove that:

$\sqrt[3]{128} + \sqrt[3]{16} - 2\sqrt[3]{54} = 0$

4) Prove that:

$\sqrt[3]{54} \times \sqrt[3]{16} \div (\sqrt[3]{4} \times 6) = 1$

5) Simplify

$\sqrt[3]{81} + \sqrt[3]{-24} - 3\sqrt[3]{\frac{1}{9}}$

6) Simplify

$\sqrt[3]{54} + \sqrt[3]{-2}$

2) Find the result of:

1) $\sqrt[3]{24} - 6\sqrt[3]{13\frac{8}{9}}$

2) $\sqrt[3]{54} - \sqrt[3]{16}$

3) If $a = \sqrt[3]{5} + 1$, $b = \sqrt[3]{5} - 1$ find the value of each of the following

- $(a - b)^5$

- $(a + b)^3$

4) If $X = 3 + \sqrt[3]{6}$, $Y = 3 - \sqrt[3]{6}$, find the value of: $\left(\frac{X - Y}{X + Y}\right)^3$

Unit (1)

Lesson (9): Applications on the real numbers

1) The cube:

Area of each face = $S \times S = S^2$

Lateral area (L.A) = $S \times S \times 4$

Total area (T.A) = $S \times S \times 6$

Volume = $S \times S \times S = S^3$

$S = \sqrt[3]{volume}$

Exercises (1-12):

1) **Complete the following:**

1) If the edge length of a cube is 5 cm, then its volume =....cm^3

....

....

2) The edge length of a cube is 4 cm, then its total area = ...cm^2

....

....

3) The lateral area of a cube whose edge length is 1 cm = ...cm^2

....

....

2) Choose the correct answer from those given:

1) The volume of a cube is 1 cm^3 , then the sum of its edge lengths = ……. Cm.

(a) 1 (b) 6 (c) 8 (d) 12

2) The volume of a cube is 64 cm3, then the sum of its lateral area = ……. Cm^2.

(a) 4 (b) 8 (c) 64 (d) 96

3) The edge length of a cube whose volume is $2\sqrt{2}$ cm^3 =….cm

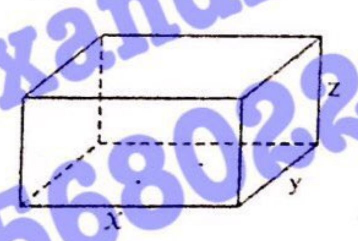
(a) $\sqrt{2}$ (b) 2 (c) 8 (d) 1.5

2) The cuboid:

1) Its lateral area = the perimeter of the base × height.

2) Its total area (the area of its six faces) =

The lateral area + twice the area of the base

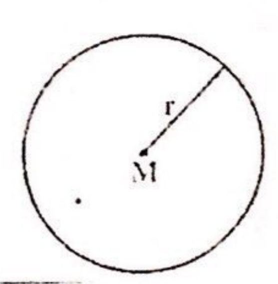


3) Its volume = the area of the base × the height

3) The circle:

1) The circumference of the circle = $2\pi r$ length unit.

2) The area of the circle = πr^2 square unit.

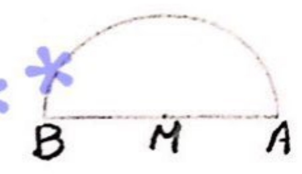


Exercises (1-13):

1) A circle whose area is 64π cm^2. Find the length of its radius, then find its circumference approximating it to the nearest integer. ($\pi = 3.14$)

2) **In the opposite figure:**

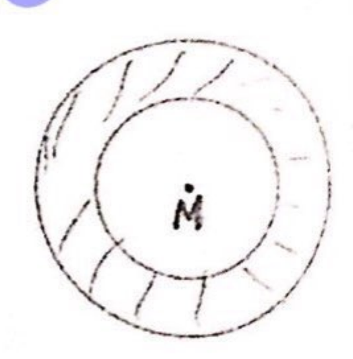
$\overline{AB}$ is a diameter of the semicircle. If the area Of this region is 12.32 cm^2. Find the perimeter of the figure



3) **In the opposite figure:**

These are two concentric circles at M and their radii length are 3cm and 5cm

Find the area of the shaded part in terms of π



4) The right circular cylinder:

1) The lateral area of the cylinder = $2\pi rh$ square unit.

2) The total area of the cylinder = the lateral area of the cylinder + $2 \times$ base area

$= 2\pi rh + 2\pi r^2$ square unit

3) The volume of the cylinder = the area of the base × height

$= \pi r^2 h$ cube unit

Exercises (1-14):

1) Find the lateral area for a right circular cylinder of volume 924 cm^3, and of a height 6 cm.

2) Find the total area of a right circular of volume 7536 cm^3 . And its height is 24 cm. ($\pi = 3.14$)

3) Find the height of a right circular cylinder whose height is equal to its base radius length and its volume is 72π cm^3.

5) The sphere:

1- The area of the sphere = $4 \pi r^2$ square unit.

2- The volume of the sphere = $\frac{4}{3} \pi r^3$ cube unit.

Exercises (1-15):

Consider $\pi = \frac{22}{7}$ if there are not any other values given

1) Find the volume and the surface area of a sphere if the length of its diameter is 4.2 cm.

2) The volume of a sphere is 562.5π cm^3. Find its surface area in terms of π

3) Choose:

1) The volume of the sphere whose diameter length is 6 cm = ... cm^3.

(a) 288 (b) 12π (c) 36π (d) 288π

....

....

2) If three quarters of volume of a sphere equals $8\pi\ cm^3$, then the length of its radius = ... cm

(a) 64 (b) 8 (c) 4 (d) 2

....

....

4) A lead cuboid in which the lengths of its dimensions are 77 cm, 24 cm and 21 cm. It was melted to make a sphere. Find the radius length of that sphere.

5) A metallic sphere , with diameter length 6 cm has got melt and changed into a right circular cylinder with base radius length 3 cm. Find its height.

6) A right circular cylinder has a height of 20 cm. Find its base radius length if its volume equals $\frac{4}{9}$ of the volume of a sphere with a diameter length of 30cm.

Unit (1)

Lesson (10): Solving equations and inequalities of the first degree in one variable in R

Exercises (1-16):

1) **Find the solution set for each of the following equation in R:**

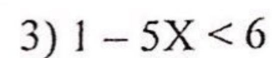
1) $2X - 3 = 4$

2) $X + 2\sqrt{3} = 3$

2) **Find the solution set for each of the following inequalities in R in the form of an interval, then graph the solution on the number line:**

1) $5 - X > 3$

2) $2X + 5 \geq 3$



3) $1 - 5X < 6$

4) $\frac{1}{2}X + 1 \leq 2$

Find

5) $3 - 2X \leq 7$

6) $1 < 5 - X \leq 3$

7) $\sqrt[3]{-8} \leq X + 1 \leq \sqrt{9}$

8) $5 < 3 - X \leq 3^2$

9) $|-3| < 2X - 1 < 5$

10) $5X - 3 < 2X + 9$

11) $4X \leq 5X + 2 < 4X + 3$

12) $X - 1 < 3X - 1 \leq X + 1$

General Exercises

1) Complete the following:

1) $\sqrt[3]{64} = \sqrt{\ldots\ldots}$

2) $]2, 5] \cap [2, 5[= \ldots\ldots$

3) $]-\infty, 1] \cap [-4, \infty[= \ldots\ldots$

4) $[2, \infty[- [4, \infty[= \ldots\ldots$

5) $[2, 5] - \{2, 5\} = \ldots\ldots$

6) $\{-1, 0, 1\} \cap]-1, 1[= \ldots\ldots$

7) The multiplicative inverse of the number $\frac{3}{\sqrt{3}}$ is $\frac{\ldots\ldots}{\sqrt{3}}$

8) If $\sqrt{x} = \sqrt{2} + 1$, then $x = \ldots\ldots$

9) the sum of lengths of all edges of a cube is 36 cm, then its total area equals …… cm^2

10) If $-x < 2$, then $x \in \ldots\ldots$

11) The S.S of the inequality: $-x + 1 \leq 0$ in R is ………

12) If $2 < x < 5$, then $3x - 1 \in \ldots\ldots$

13) If $x - 3 \geq 0$, then x ………

14) If $5x < 15$, then x ....

15) If $1 - x > 4$, then x ....

16) If $-2x \leq 3$, then x ....

17) If $\sqrt{2}x \leq 4$, then x ....

18) The S.S of the inequality: $4 < 2x < 8$ in R is ....

2) Choose the correct answer from those given:

1) The opposite figure represents the interval.......



(a) [-3, 4]   (b)]-3, 5[(c) [-3, 5[(d)]-3,5]

....

....

2) [-3, 5] ∩ [2, 6] = ...

(a) [-3, 2]   (b) [-3, 6]   (c) [2, 4]   (d)]2,6[

....

....

3) [-3, 2] – {-3, 6} = ...

(a)]-3, 6[(b)]-3, 2[(c)]-3, 2]   (d) φ

....

....

4) $\{8, 9, 10\} -]8, 10[=$ ....

(a) φ (b) $\{8, 10\}$ (c) $\{9\}$ (d) N

....

....

5) The multiplicative inverse of the number $\sqrt{5}$ is ....

(a) $-\sqrt{5}$ (b) $-\frac{1}{\sqrt{5}}$ (c) $\frac{\sqrt{5}}{5}$ (d) $\frac{5}{\sqrt{5}}$

....

....

6) If $x = \sqrt{7} + \sqrt{3}$ and $y = \sqrt{7} - \sqrt{3}$, then $xy =$ ....

(a) 4 (b) 10 (c) 40 (d) 58

....

....

7) The volume of a cube is 64 cm^3, then its edge length is ....

(a) 32 cm (b) 16 cm (c) 8 cm (d) 4 cm

....

....

8) The volume of a cube is 125 cm^3, then its total area equals ...

(a) 25 cm^2 (b) 50 cm^2 (c) 125 cm^2 (d) 150 cm^2

....

....

9) The circumference of a circle is 44 cm, then its diameter length is ……….. ($\pi = \frac{22}{7}$)

(a) 14 cm (b) 22 cm (c) 44 cm (d) 154 cm

……………………………………………………………………

……………………………………………………………………

10) If the radius length of a sphere is 3 cm, then its volume is ...

(a) 4π cm^3 (b) 9π cm^3 (c) 27π cm^3 (d) 36π cm^3

……………………………………………………………………

……………………………………………………………………

11) If the volume of the sphere is $\frac{32}{3}\pi$ cm^3 , then its diameter is of length ………

(a) 2 cm (b) 4 cm (c) 8 cm (d) 32 cm

……………………………………………………………………

……………………………………………………………………

12) The volume of a right circular cylinder is 90π cm^3 and its height is 10 cm, then the radius length of its base equals ….

(a) 3 cm (b) 4.5cm (c) 5 cm (d) 9 cm

……………………………………………………………………

……………………………………………………………………

13) The S.S of the inequality: $3 \leq x + 2 < 5$ in R equals……

(a) [1, 3[(b)]1, 3] (c) [1, 3] (d)]1,3[

……………………………………………………………………

……………………………………………………………………

3) If $a = \sqrt{2} + 1$ and $b = \frac{1}{1+\sqrt{2}}$, then find the value of: $(a - b)^2$

4) If $x = 2\sqrt{2} - \sqrt{3}$ and $y = \frac{5}{2\sqrt{2} - \sqrt{3}}$, then prove that x and y are two conjugate numbers.

5) **Find** in the form of an interval the S.S of the inequality:

$\frac{3x+1}{6} < x+1 < \frac{x+4}{2}$ in R and represent it on the number line.

6) **Find** the value of: $\sqrt{75} - 2\sqrt{27} + 3\sqrt{\frac{1}{3}}$

7) Reduce to the simplest form: $2\sqrt{5}(\sqrt{5}-2)+\sqrt{20}+10\sqrt{\frac{1}{5}}$

8) A right circular cylinder whose height equals the radius length of its base and its volume equals 27π cm^3. Calculate its lateral area.

9) Find the volume of the sphere whose radius length equals the radius length of the base of a right circular cylinder of volume 7536 cm^3. And its height is 24 cm.

Unit (2) Real numbers

Lesson (1): Relation between two variables.

Lesson (2): Slope of straight line.

Lesson (3): Real life applications on the slope.

Unit (2) Real numbers

Lesson (1): Relation between two variables

- The linear relation $aX + bY = c$
- The graph will be straight line.

Exercise (2-1):

1) **Complete the following ordered pairs which satisfy the relation: $y = 3x - 1$**

(5, ………) , (2, ………) , (0, ………) , (-3, ………)

……………………………………………………………………………

……………………………………………………………………………

……………………………………………………………………………

……………………………………………………………………………

……………………………………………………………………………

……………………………………………………………………………

2) **Find four ordered pairs to satisfy each of the following relations:**

1) $2x - y = 5$



2) $y = \frac{1}{2}x + 5$

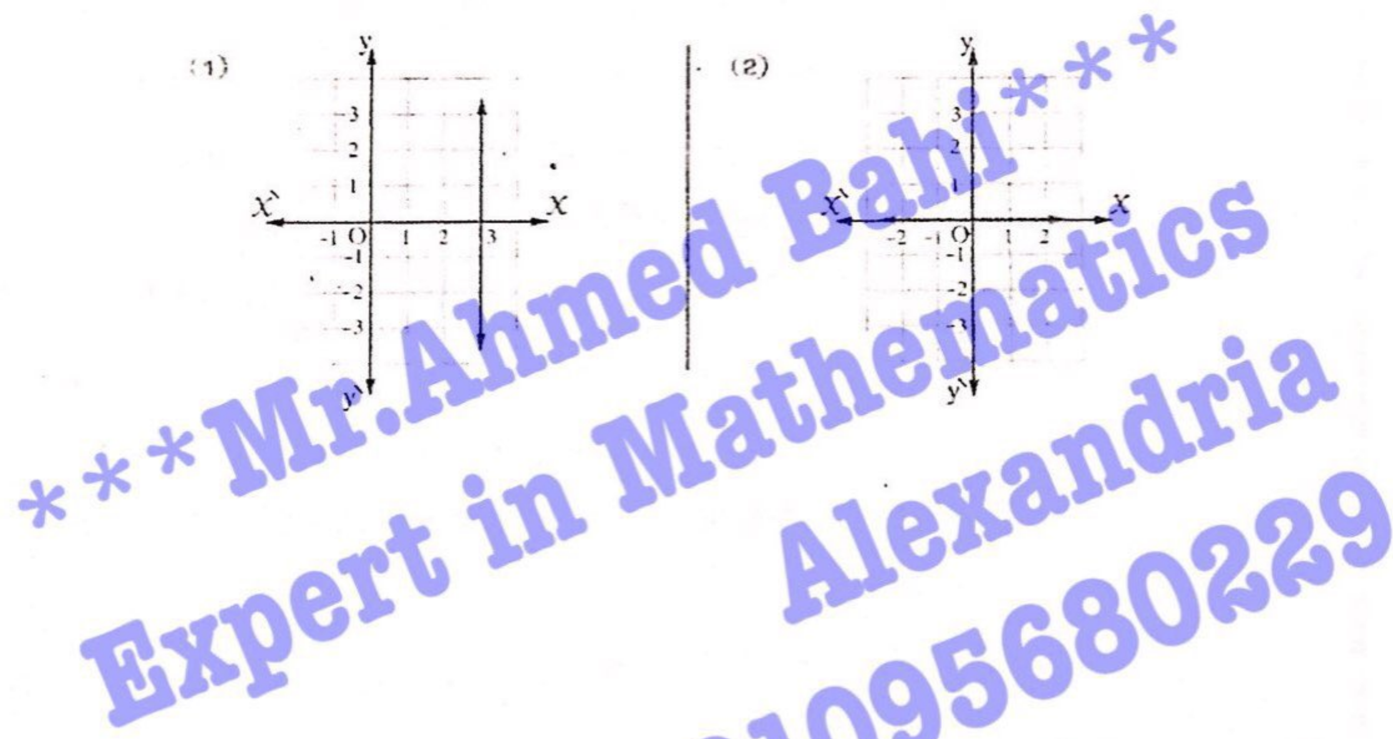
3) $Y = 2$

4) $2x = 5$

3) Find the value of b, where (-3, 2) satisfies the relation:

$$3X + bY = 1$$

4) <u>Find the relation that is represented by the line in each figure bleow:</u>



5) Find the value of k, where (k, 2k) satisfies the relation: $x+y = 15$

6) Choose the correct answer from those given:

1) If (2, -5) satisfies the relation: $3x - y + c = 0$, then c = ……

(a) 1 (b) -1 (c) 11 (d) -11

……………………………………………………………

……………………………………………………………

2) Which of the following ordered pairs satisfies the relation:

$2x + y = 5$?

(a) (-1, 3) (b) (1, 3) (c) (3, 1) (d) (2, 2)

……………………………………………………………

……………………………………………………………

3) (3, 2) does not satisfy the relation:

(a) $y + x = 5$ (b) $3y - x = 3$ (c) $y + x = 7$ (d) $x - y = 1$

……………………………………………………………

……………………………………………………………

4) The point (3, 5) lies on the straight line which represents the relation …………

(a) $y = 3x - 5$ (b) $2x - y = 1$ (c) $3x + y = 1$ (d) $y = 3x - 1$

……………………………………………………………

……………………………………………………………

5) If (-1, 5) satisfies the relation: $3X + kY = 7$, then k = ……

(a) 2 (b) -2 (c) 1 (d) 10

……………………………………………………………

……………………………………………………………

7) Represent graphically the following relation: $x + y = 2$

8) **Graph** the relation: $2x + 3y = 6$ If the straight line representing this relation intersects the x-axis at point A and the y-axis at point B, Find the area of the triangle OAB where O is the origin point.

Unit (2)

Lesson (2): Slope of straight line

Definition:

The slope of the straight line = $\frac{\text{the change in } y - \text{coordinate s}}{\text{the change in } x - \text{coordinate s}}$

$= \frac{\text{the vertical change}}{\text{the horizontal change}}$

i.e * $S = \frac{y_2 - y_1}{x_2 - x_1}$, where $x_1 \neq x_2$ * S is undefined if $x_1 = x_2$

Exercise (2-2):

1) **In the opposite figure:**

ABC is a triangle. Complete by using one of the following words (positive, negative, zero, undefined)

The slope of $\overleftrightarrow{AB}$ is ....

The slope of $\overleftrightarrow{BC}$ is ....

The slope of $\overleftrightarrow{AO}$ is ....

The slope of $\overleftrightarrow{AC}$ is ....

2) **<u>In the opposite figure:</u>**

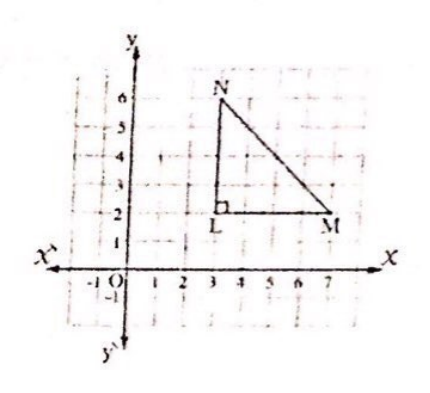
LMN is a right-angled triangle at L,

where m ($\angle$M) = 45°

Given that L (3, 2) and M (7, 2),

Find the coordinates of N and calculate

the slope of $\overleftrightarrow{MN}$



3) If A (2, -1), B (10, 3) and C (2, 3), Find the slope of each of $\overleftrightarrow{AB}$, $\overleftrightarrow{BC}$ and $\overleftrightarrow{CA}$ Draw the triangle ABC on a square grid, then mention the type of the triangle according to the measures of its angles.

4) **Find the slope of the straight line passing through the two points in each of the following:**

1) A (1, 2), B (5, 0)

2) A (2, -1), B (4, -1)

2) 3) A (-1, 3), B (2, 1)

4) A (3, -2), B (4, 1)

5) **Find** the slope of each of $\overleftrightarrow{AB}$, $\overleftrightarrow{BC}$ and $\overleftrightarrow{AC}$ where A (2, 1), B (3, 2) and C (4, 5) and represent each line graphically. What do tou observe?

6) In each of the following, prove that the points A, B and C are collinear:

1) A (1, 1) , B (2, 2) , C (-3, -3)

2) A (4, -3) , B (-6, 7) , C (5, -4)

3) A (-2, 12) , B (2, 4) , C (6, -4)

7) Find the slope of the line $\overleftrightarrow{AB}$, where A (-1, 3) and B (2, 5) Is the point C (8, 1) $\in \overleftrightarrow{AB}$?

General Exercises

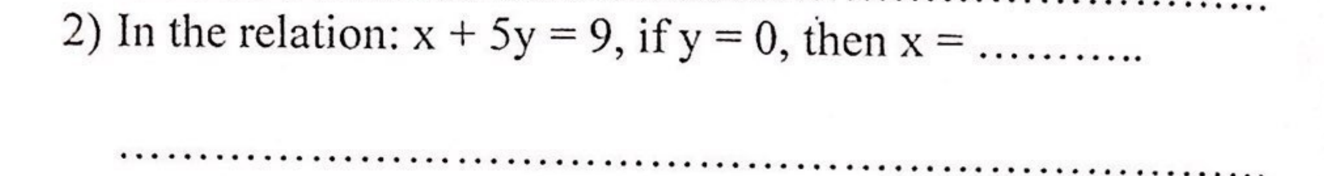
1) Complete the following:

1) In the relation: $y = 3x + 4$, if $x = 1$, then $y =$ ....

....

....

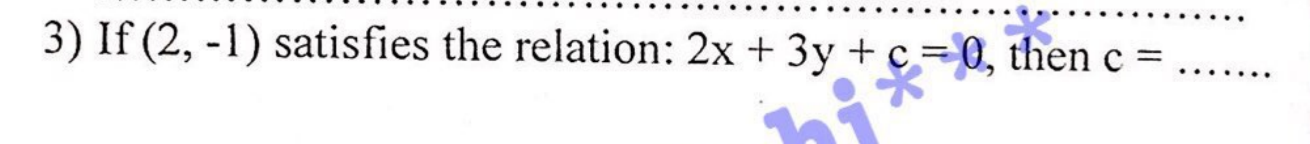
2) In the relation: $x + 5y = 9$, if $y = 0$, then $x =$ ....



....

....

3) If (2, -1) satisfies the relation: $2x + 3y + c = 0$, then $c =$ ....



....

....

4) If (a, 3) satisfies the relation: $2x - y = 7$, then $a =$ ....

....

....

5) If (k, 2k) satisfies the relation: $x + y = 15$, then $k =$ ....

....

....

6) The relation: $2x + 3y = 18$ is represented by a straight line intersecting X-axis at the point ....

....

....

7) The straight line representing the relation: $y = 2x + 5$

intersects y-axis at the point ………….

……………………………………………………………………

……………………………………………………………………

8) If A = (3, -2), B = (-1, 4), then the slope of $\overleftrightarrow{AB}$ = …………

……………………………………………………………………

……………………………………………………………………

9) The straight line passing through the two points (-3, 1), (2, 5)

its slope is ……………..

……………………………………………………………………

……………………………………………………………………

10) The slope of the straight line that parallels y-axis is………

……………………………………………………………………

……………………………………………………………………

11) The slope of the straight line that parallels x-axis is………

……………………………………………………………………

……………………………………………………………………

2) Choose the correct answer from those given:

1) The ordered pair that doesn't satisfy the relation: $y = x + 1$ is ……………

(a)(0, 1) (b) (2, 3) (c) (1, 2) (d) (2, 5)

…………………………………………………………………………

…………………………………………………………………………

2) The ordered pair (5, 2) doesn't satisfy the relation ………

(a) $2x - y - 8 = 0$ (b) $y - x + 3 = 0$

(c) $2y - x = 1$ (d) $\frac{x}{5} + \frac{y}{2} = 2$

…………………………………………………………………………

…………………………………………………………………………

3) If (5, 2m) satisfies the relation: $y = 3x - 1$, then m = ……

(a) 2 (b) 7 (c) 10 (d) 14

…………………………………………………………………………

…………………………………………………………………………

4) If the ordered pair (2k, k) satisfies the relation: $y + 2x = 5$, then k = ……………

(a) 1 (b) 2 (c) 3 (d) 4

………………………………………………………………………

………………………………………………………………………

5) The relation: $3x + 4y = 12$ is represented by a straight line intersects the x-axis at the point …………..

(a) (0, 3) (b) (3, 0) (c) (4, 0) (d) (0, 4)

………………………………………………………………………

………………………………………………………………………

6) The slope of the straight line that passes through the two points (3, 2) and (-5, 3) is …………..

(a) $\frac{1}{8}$ (b) $-\frac{1}{8}$ (c) 8 (d) -8

………………………………………………………………………

………………………………………………………………………

Unit (3)

Lesson (1): Collecting and organizing data.

Lesson (2): The ascending and descending cumulating frequency tables and their graphical represent ratio.

Lesson (3): Mean.

Lesson (4): Median.

Lesson (5): Mode.

Unit (3)

Lesson (3): Mean

Remarks:

1) The mean of a set of values = $\frac{\text{The sum of values}}{\text{Number of values}}$

2) The centre of a set = $\frac{\text{the lower limit} + \text{the upper limit}}{2}$

Exercise (3-3):

1) **Complete:**

1) The centre of the set = $\frac{\text{.................} + \text{.................}}{2}$

....

....

2) The arithmetic mean of the values: 5, 12, 17, 6 is ....

....

....

3) If the lower limit of a set is 8 and the upper limit of the same set is 14, then its centre is ....

....

....

4) If the lower limit of a set is 4 and its centre is 9, then its upper limit is ....

....

....

5) If the mean of a frequency distribution is 39.4 and the total of frequencies is 100, then the total of the products of frequencies of the sets by their centres =.............

....

....

2) Find the mean of the following frequency distribution:

Sets	5 -	15 -	25 -	35 -	Total
Frequency	6	8	4	2	20

....

....

....

....

3) The following table shows the frequency distribution of the weights of 30 children in kg:

Weight (kg.)	6-	10-	14-	18-	22-	26-	30-	Total
Frequency	2	3	.....	8	6	4	2	30

Complete the table, then find the mean of this distribution

....

....

....

....

Unit (3)

Lesson (4): Median

To find the median of a set of values, do as follows:

Arrange the values ascendingly or descendingly

↓

If the values number is odd, then

↓

The median is the value lying in the middle Exactly

↓

For example:

If the values are

42, 23, 17, 30 and 20

We arrange them ascendingly as follows

17, 20, 23, 30, 42

The median = 23

If the values number is even, then

↓

The median $= \frac{\text{The sum of the two values lying in the middle}}{2}$

↓

For example:

If the values are

27, 13, 23, 24, 13 and 21

We arrange them ascendingly as follows

13, 13, 21, 23, 24, 27

The median $= \frac{21+23}{2} = 22$

Exercise (3-4):

Complete:

1) The median of the values: 3, 7, 2, 9 and 11 is ……………

………………………………………………………………………

………………………………………………………………………

2) The order of the median of the values: 7, 6, 5, 8 and 4 is ……

………………………………………………………………………

………………………………………………………………………

3) If the order of the median of a set of values is the fourth, then the number of these values equals …………

………………………………………………………………………

………………………………………………………………………

4) If the median of the values: k +1, k +2, k +5, k +4 and k +3 where k is a positive integer is 13, then k = …………

………………………………………………………………………

………………………………………………………………………

Unit (3)

Lesson (5): Mode

Note:

The mode of a set of values is the most common value in the set, or in other words, it is the value which is repeated more than any other values.

For example:

The mode of the set of the values 7, 3, 4, 1, 7, 9, 7, 4 is 7

Finding the mode foe a frequency distribution with sets

The following example shows how to find the mode of a frequency distribution with sets:

Example:

The following is the frequency distribution of marks of 100 students in an exam:

Sets of marks	10-	20-	30-	40-	50-	**Total**
Number of students	16	24	30	20	10	**100**

Find the mode mark for these students

Exercise (3-5):

1) **Complete the following:**

1) The mode of the values: 5, 3, 8, 5, 9 is …………

2) The mode of the values: 8, 7, 8, 7, 6, 5, 8 is …………

3) If the mode of the values: 4, a, 5, 3 is 3, then a = …………

4) If the mode of the values: 12, 7, x +1, 7, 12 is 7, then x = …

2) **Choose the correct answer from those given:**

1) The order of the median of the set of values: 4, 5, 6, 7 and 8 is ……………

(a)third (b) fourth (c) fifth (d) sixth

………………………………………………………………………

………………………………………………………………………

2) If the order of the median of a set of values is the fourth, then the number of these values is …………

(a) 3 (b) 5 (c) 7 (d) 9

………………………………………………………………………

………………………………………………………………………

3) The median of the set of the values: 15, 22, 9, 11 and 33 is….

(a) 9 (b) 15 (c) 18 (d) 90

………………………………………………………………………

………………………………………………………………………

4) If the median of the set of the values: 27, 45, 19, 24 and 28 is x, then x = ...

(a) 24 (b) 27 (c) 28 (d) 45

....

....

5) If the arithmetic mean of the values: 27, 8, 16, 24, 6 and k is 14, then k = ...

(a) 3 (b) 6 (c) 27 (d) 84

....

....

6) If the arithmetic mean of the values: 18, 23, 29, 2k – 1 and k is 18, then k = ...

(a) 1 (b) 7 (c) 29 (d) 90

....

....

3) Complete the following:

1) If the arithmetic mean of the values: 9, 6, 5, 14 and x is 7, then x = ……………..

………………………………………………………………………

………………………………………………………………………

2) If the sum of five numbers equals 30, then the arithmetic mean of these numbers is …………

………………………………………………………………………

………………………………………………………………………

3) If the mode of the set of the values: 4, 5, a and 3 is 3, then a = ………..

………………………………………………………………………

………………………………………………………………………

4) If the mode of the set of the values: 15, 9, x + 1, 9 and 15 is 9, then x = ……….

………………………………………………………………………

………………………………………………………………………

5) If the arithmetic mean of the set of the values: 1, 6, 4, 4 and 5k is 7, then k = ……….

………………………………………………………………………

………………………………………………………………………

6) If the mode of the set of the values: 15, 9, x + 6, 9 and 15 is 9, then x = ……….

………………………………………………………………………

………………………………………………………………………

General Exercises

1) Complete the following:

1) If the arithmetic mean of the values: 9, 6, 5, 14 and x is 7, then x = ………..

…………………………………………………………………………

…………………………………………………………………………

2) If the sum of five numbers equal 30, then the arithmetic mean of these numbers is …………..

…………………………………………………………………………

…………………………………………………………………………

3) The mode of the set of the values: 14, 11, 10, 11, 14, 15, 11 is …………..

…………………………………………………………………………

…………………………………………………………………………

4) If the mode of the set of the values: 4, 5, a and 3 is 3, then a = ………..

…………………………………………………………………………

…………………………………………………………………………

5) If the mode of the set of the values: 15, 9, x + 1, 9 and 15 is 9, then x = …………

…………………………………………………………………………

…………………………………………………………………………

6) If the arithmetic mean of the set of the values: 1, 6, 4, 4 and 5k is 7, then k = …………

…………………………………………………………………………

…………………………………………………………………………

7) The value which is the most common of a set of values is called…………

……………………………………………………………

……………………………………………………………

8) If the mode of the set of the values: 15, 9, $x + 6$, 9 and 15 is 9, then $x =$ …………

……………………………………………………………

……………………………………………………………

9) The mode of the values: 5, 3, 8, 5, 9 is …………

……………………………………………………………

……………………………………………………………

10) The mode of the values: 8, 7, 8, 7, 6, 5, 8 is …………

……………………………………………………………

……………………………………………………………

11) If the mode of the set of the values: 4, a, 5, 3 is 3, then $a =$ …………

……………………………………………………………

……………………………………………………………

12) If the mode of the set of the values: 12, 7, $x + 1$, 7, 12 is 7 then $x =$ …………

……………………………………………………………

……………………………………………………………

2) **Choose the correct answer from those given:**

1) The order of the median of the set of values: 4, 5, 6, 7 and 8 is ……………

(a) third (b) fourth (c) fifth (d) sixth

……………………………………………………………………

……………………………………………………………………

2) If the order of the median of a set of values is the fourth, then the number of these values is …………..

(a) 3 (b) 5 (c) 7 (d) 9

……………………………………………………………………

……………………………………………………………………

3) The median of the set of the values: 15, 22, 9, 11 and 33 is …

(a) 9 (b) 15 (c) 18 (d) 90

……………………………………………………………………

……………………………………………………………………

4) If the arithmetic mean of the values: 27, 8, 16, 24, 6 and k is 14, then k = …………

(a) 3 (b) 6 (c) 27 (d) 84

……………………………………………………………………

……………………………………………………………………

5) If the arithmetic mean of the values: 18, 23, 29, 2k – 1 and k is 18, then k = …………

(a) 1 (b) 7 (c) 29 (d) 90

……………………………………………………………………

……………………………………………………………………

6) If the median of the set of the values: 27, 45, 19, 24 and 28 is x, then x = ………..

(a) 24 (b) 27 (c) 28 (d) 45

……………………………………………………………………

……………………………………………………………………